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IS 10236-13 (1986): Procedure for basic climatic and durability test for optical instruments, Part 13: Dust test  
[PGD 22: Educational Instruments and Equipment]

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Bhartṛhari—Nītiśatakam

“Knowledge is such a treasure which cannot be stolen”





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*Indian Standard*  
PROCEDURE FOR  
BASIC CLIMATIC AND DURABILITY  
TESTS FOR OPTICAL INSTRUMENTS

**PART 13 DUST TEST**

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BUREAU OF INDIAN STANDARDS  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

# Indian Standard

## PROCEDURE FOR BASIC CLIMATIC AND DURABILITY TESTS FOR OPTICAL INSTRUMENTS

### PART 13 DUST TEST

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# *Indian Standard*

## PROCEDURE FOR BASIC CLIMATIC AND DURABILITY TESTS FOR OPTICAL INSTRUMENTS

### PART 13 DUST TEST

#### 0. F O R E W O R D

**0.1** This Indian Standard ( Part 13 ) was adopted by the Indian Standards Institution on 21 July 1986, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

**0.2** Fast development in the field of instruments had brought a significant change in their basic content and design. It has been felt over the years that IS : 2352-1963\* does not cater for the present day needs of the instruments and is also not in line with the recent trends in climatic and environmental testing procedures to be adopted for improving their quality and reliability. It has, therefore, become necessary to have uniform and more rational testing procedures as far as possible. This series of standards on climatic and durability test ( IS : 10236 ) has been prepared with this objective.

**0.2.1** It is proposed to withdraw the existing Indian Standard ( IS : 2352-1963\* ) as soon as the tests mentioned therein are covered in the new series of IS : 10236.

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#### 1. SCOPE

**1.1** This standard ( Part 13 ) covers the procedure for conducting dust test for optical instruments.

#### 2. TERMINOLOGY

**2.1** For the purpose of this standard, the definitions given in IS : 10236 ( Part 1 )† shall apply.

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\*Procedure for basic climatic and durability tests for optical instruments.

†Procedure for basic climatic and durability tests for optical instruments: Part 1 General. (*under preparation*).

### **3. OBJECT**

**3.1** The object of this test is to determine the suitability of optical instruments to withstand the abrasive action of dust and other conditions such as encountered in dusty atmosphere.

### **4. INITIAL MEASUREMENTS**

**4.1** The instrument shall be visually examined, and optically, electrically and mechanically checked as required by the relevant instrument specification.

### **5. TEST CHAMBER**

**5.1** The chamber used for this test shall have characteristics as specified in **5.1.1** to **5.1.7**.

**5.1.1** The chamber shall be capable of circulating dust in its working space as to produce a dust concentration specified under **5.1.5**.

**5.1.2** It shall also be capable of maintaining its working space at a temperature desired by the required severity with a tolerance of  $\pm 3^{\circ}\text{C}$  and relative humidity not exceeding 50 percent even when there is no agitation of dust in the chamber.

**5.1.3** The dust used for this test shall be dry. If slight moisture is anticipated the dust shall be heated outside to a temperature near to the specified severity before the commencement of the test. A sufficient quantity of dust shall also be made available in the chamber in order to obtain specified dust concentration throughout the test.

**5.1.4** The dust used in the chamber shall have the physical characteristics and composition as given below.

#### **5.1.4.1 Physical characteristics**

- a) 100 percent dust shall pass through sieve having aperture size of  $150 \mu\text{m}$
- b)  $98 \pm 2$  percent dust shall pass through sieve having aperture size of  $110 \mu\text{m}$
- c)  $90 \pm 2$  percent dust shall pass through sieve having aperture size of  $75 \mu\text{m}$
- d)  $75 \pm 2$  percent dust shall pass through sieve having aperture size of  $46 \mu\text{m}$

*See IS : 460  
(Part 1)-1985\**

\*Specification for wire cloth test sieves ( third revision ).

### 5.1.4.2 Composition

Substance	Percent by Weight
SiO <sub>2</sub>	97 to 99
Fe <sub>2</sub> O <sub>3</sub>	0 to 2
Al <sub>2</sub> O <sub>3</sub>	0 to 1
TiO <sub>2</sub>	0 to 2
MgO	0 to 1
Ignition losses	0 to 1

5.1.5 A simple dust concentration measuring device is shown in Fig. 1. Dust enters the box through the five circular holes and collects at the bottom of the detachable cover. For measuring dust concentration, the device shall be placed in any representative position ( where the effect of dust on the specimen is maximum ) within the dust chamber. The air shall be circulated for five minutes and the dust shall be allowed to enter and settle down at the bottom of the device. The amount of dust collected on the detachable cover inside the device shall be  $25 \pm 5$  grams.

5.1.6 It shall have provision to supply electric power to the specimen under test from an external source.

5.1.7 To see functioning of the instrument, when required, the chamber shall have a provision of suitable viewing window.

## 6. TEST SEVERITIES

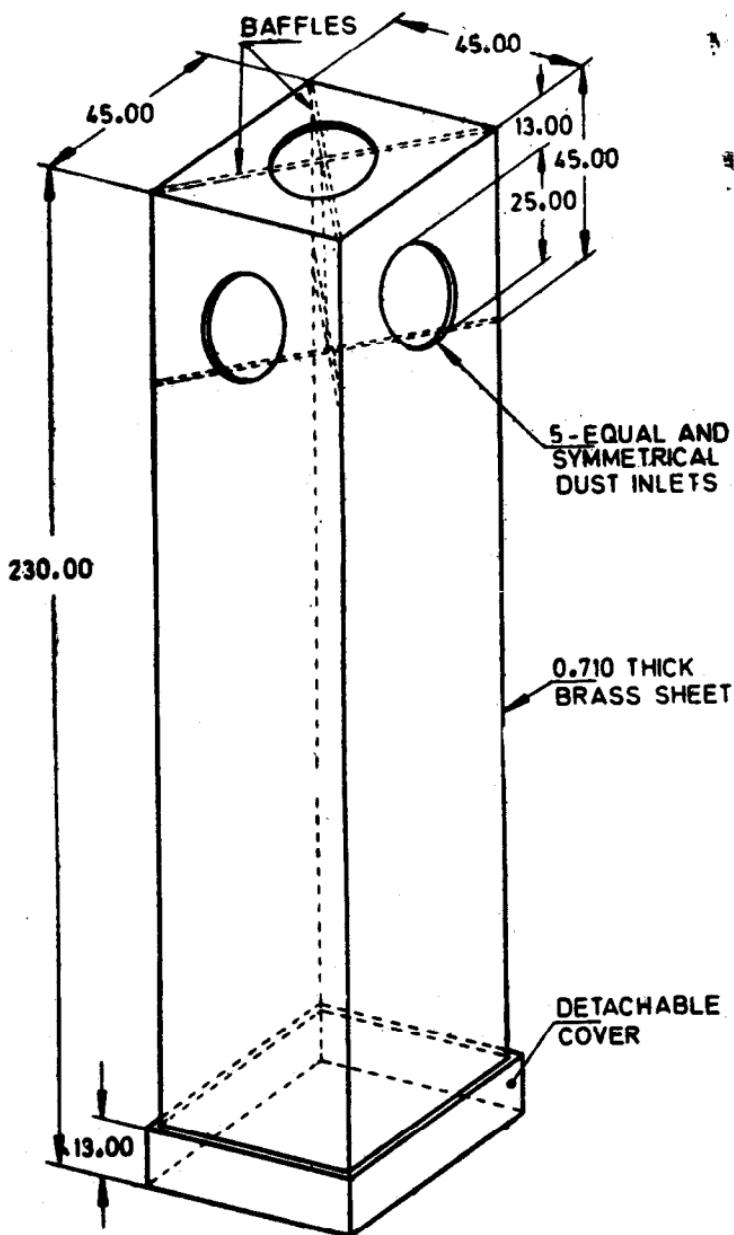
6.1 The severity indicated by temperature and duration shall be as specified in the relevant instrument specification. The value may be selected from those given below:

- |  |   |                           |
|--|---|---------------------------|
| a) $50^{\circ}\text{C} \pm 3^{\circ}\text{C}$ for 2 hours            | } | R.H. less than 50 percent |
| b) $40^{\circ}\text{C} \pm 3^{\circ}\text{C}$ for 1 hour             |   |                           |
| c) $40^{\circ}\text{C} \pm 3^{\circ}\text{C}$ for $\frac{1}{2}$ hour |   |                           |

## 7. TEST PROCEDURE

7.1 The instrument shall be subjected to this test in the unpacked and switched off condition.

7.2 While at the laboratory temperature the instrument shall be introduced into the chamber, the latter also being at the laboratory temperature.



All dimensions in millimetres.

FIG. 1 APPARATUS FOR MEASURING DUST CONCENTRATION

**7.3** The temperature of the chamber shall then be raised to the specified value given in **6.1** or any other value specified by the relevant instrument specification. The relative humidity shall be maintained at a value not exceeding 50 percent.

**7.4** After the temperature equilibrium is reached the instrument shall be subjected to the stream of dust laden air for a period as given in **6.1** or any other period specified in the relevant instrument specification.

**7.5** If required by the relevant instrument specification, the instrument shall be switched on and a performance check shall be carried out at any time during the period specified in **7.4**.

**7.6** The circulation of dust shall then be stopped and the temperature of the chamber shall be restored to the laboratory atmospheric conditions.

**7.7 Recovery** — The instrument shall then be removed from the chamber and kept under standard atmospheric conditions for recovery for not less than one hour nor more than two hours.

## **8. FINAL MEASUREMENTS**

**8.1** After recovery the accumulated dust shall be removed before the observations are made. The dust shall be removed by brushing, wiping or shaking. Under no circumstances shall the dust be removed by an air blast or by vacuum cleaning.

**8.2** The instrument shall be visually examined for any deleterious effects on optical and other surfaces, finishes and markings and for ease of working of moving parts; its performance shall also be checked in accordance with the relevant instrument specification.

## **9. DETAILS TO BE GIVEN IN RELEVANT INSTRUMENT SPECIFICATION**

**9.1** The relevant instrument specification shall state the following for carrying out this test:

- a) Initial observations/measurements;
- b) Test severity;
- c) Test position for the instrument, if important;
- d) Performance check while under operation, if required;
- e) Final observations/measurements; and
- f) Any deviation from the normal procedure.

